**OBJECTIVE OF STUDY**

This study is devised mainly with two objectives;

Firstly, to obtain the tool for understanding in depth the influence of physicochemical properties of different drugs and their interaction with polymers of various properties.

Secondly, to identify polymer drug formulations with good drug loading and slow release for using anti cancer therapy. Through this study we are also trying to understand the effect of these drug polymer interactions on the drug entrapment and release profile from the polymeric matrix. Polymers such as PLA, PGA and their copolymers (PLGA) have been extensively studied for nanoparticle formulations however due to limited chemical functionality in their backbone, the physicochemical properties of these polymers is nearly constant.

The block copolymers developed so for either contains no functional groups at all in the hydrophobic block such as PCL, PLA or contain a functional group in every monomer unit as in poly (aspartic acid) when functional groups are not contained in the hydrophobic block of the polymer, no other interactions such as hydrogen bonding, ionic interactions can be expected between the copolymer and the drug.

Consequently for many studies reported in the literature, drug is not very well loaded into the particle or micelle and these polymers have a relatively low drug loading efficiency. In the case of fully functionalized polymers the polymers may be the water-soluble and unable to form a micelle or a particle in an aqueous medium.

Thus, the amphiphilicity of the polymer results in a problem that is, the chemical conjugation of a hydrophobic drug is needed with the functional group of the core block. Hence, fictionalization of polymer blocks has been attempted. For example PEO-PLA block copolymers containing a small quantity of carboxylic acid in the PLA block were successfully synthesized. The nanoparticle prepared from the functionalized block copolymer had a very low CMC value, which suggests good stability of the nanoparticle. The drug loading efficiency of nanoparticle was dramatically increased with the content of carboxylic acid in the block copolymers.

This result may be attributed to the hydrogen bonding between copolymers and drug.
The release rate of drug was slower from nanoparticle containing higher amounts of carboxylic acid in the copolymer, which might be associated with the enhanced interaction between the carboxylic group of copolymers and the drug. The nature of drug polymer interaction may therefore significantly influence the drug loading and release pattern. 58, 59, 60

To assess the potential of a novel poly (glycerol adipate) back bone and various substituted variants of this polymer to assemble into nanoparticle using a simple method and in the absence of a surfactant.

To provide nanoparticle formulations for both, hydrophobic and hydrophilic drugs with good drug loading and sustained drug release profile compared to existing polymeric nanoparticles.

To modify the properties of the polymer by attaching different functional groups and to study their influence on drug loading and release for a wide range of drugs with differing structures and chemistries.

Overall, to provide a better understanding of effect of drug polymer chemistries on their interactions in nanoparticles.

The study will begin with the detailed investigations of DXMP, a water soluble steroid which is chosen as the model drug, for drug incorporation and release from back bone and various acyl substituted polymers. Influence of chain length of acyl group substituent along with degree of substitution on drug incorporation and release will be studied. Further into the study, drugs such as CYT-ARA, ETO, ETO-P and PTx will be included. Along with the acylated polymers, amino acid substituted polymers will also be investigated. Drug release studies will provide significant insight into the influence of drugs polymer interactions on the release pattern, as release from a dispersion of drugs in the presence of polymer matrices usually is much faster than its release pattern from nanoparticles. DSC and FTIR will also be employed to obtain a better insight into the influence of drug polymer interactions in NPs.